# Production Conference

## 3-Sided v. 4-Sided Precast Structures

## April 28, 2008

Merril E. Dougherty, PE


CATBERT: EVIL H.R. DIRECTOR
WALLY, YOU'VE BEEN TOO BUSY TO GET THE REQUIRED FORTY HOURS OF TRAINING THIS YEAR.
SO I HIRED A CONTRACT EMPLOYEE TO HELP YOU OUT.
WHEN DOES HE START?
YESTERDAY. HE ALREADY FINISHED EIGHT HOURS OF YOUR TRAINING.
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# 3-Sided / 4-Sided Structures

- Both structures are reinforced concrete
- 3-sided structures are open on the bottom
- 4-sided structures have a solid bottom
- When sizes overlap both structure types may be specified on the plans

# 3-Sided / 4-Sided Structures

- 3-sided structures with spans ≥ 30 feet require a cost comparison with a bridge
- Headwall and Wingwalls are required for cost savings and permitting
  - Improved inlet can reduce culvert size
  - Reduces culvert length
  - Reduces Encapsulation to help with IDEM 401 permitting
  - May reduce/eliminate right-of-way needed

# 3-Sided Structures

- Available in spans from 12 feet to over 40 feet
- Require footers to support the structures since they have no bottom
- Require riprap to protect the footers from scour
- Can have a bend or curve cast into the segments

# Types of 3-Sided Structures

- Con Span has an arch top and straight legs (3-sided arch top structure)
- Hy-Span and Tri-Span have flat tops and straight legs (3-sided flat top structure)

# 4-Sided Structures

- Available in spans from 3 feet to 20 feet
  - Traditionally 3 feet to 12 feet
  - Sizes from 14 feet to 20 feet are recent additions
    - "MegaBox" CSR Masolite
    - "Colossal Box" Independent Concrete Pipe
- Footings are not required, the bottom supports the load
- Referred to as box culverts (RCB)


PC 15


PC1

# Alternate Structures

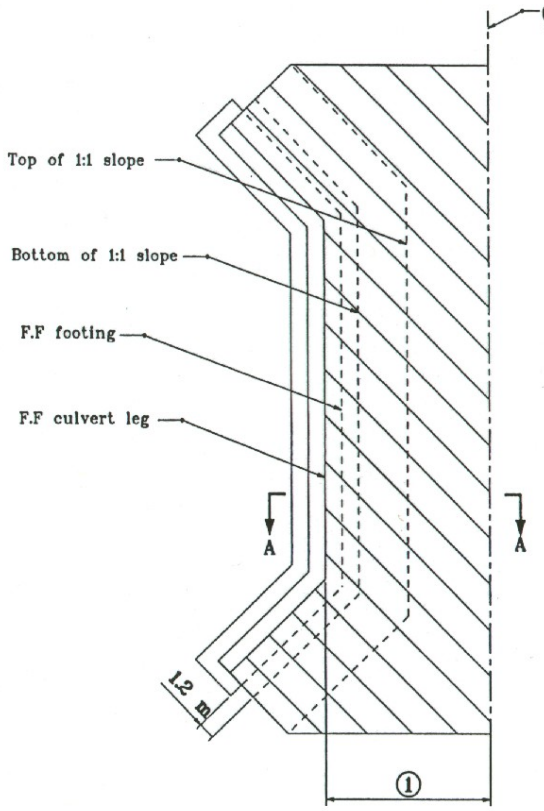
- Typically require alternate materials for competitive bidding
  - 3-sided (arch and flat top) and 4-sided box
  - FHWA Requirements
  - Plan Requirements

# IDEM Sumping Requirement

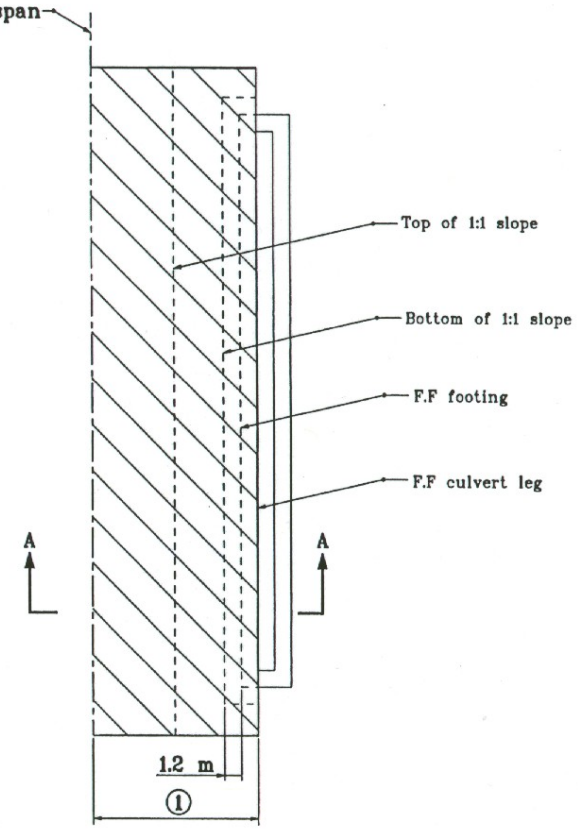
- Rule requires culverts with bottoms to be sumped 20%
- INDOT is currently meeting with IDEM to try to minimize the sumping requirement

# IDEM Sumping Requirement

- 4-Sided require additional rise that is buried under the flowline
- 3-Sided requires a change to the standard drawings for scour protection




PLAN – WITH WINGWALLS




PLAN – PROJECTING

All dimensions are in mm unless otherwise specified.

**NOTES:**

① Half of span width.

2. Crosshatched area indicates riprap limits.

3. See Standard Drawing 714-CCSP-02 for Section A-A, for span width of 6.0 m or greater. See Standard Drawing 714-CCSP-03 for Section A-A for span width from 3.0 m to less than 6.0 m.

**RIPRAP METHOD**

F.F. = Front face

INDIANA DEPARTMENT OF TRANSPORTATION

THREE-SIDED CONCRETE CULVERT SCOUR PROTECTION

JUL98 FOR JAN99

STANDARD DRAWING NO. 714-CCSP-01

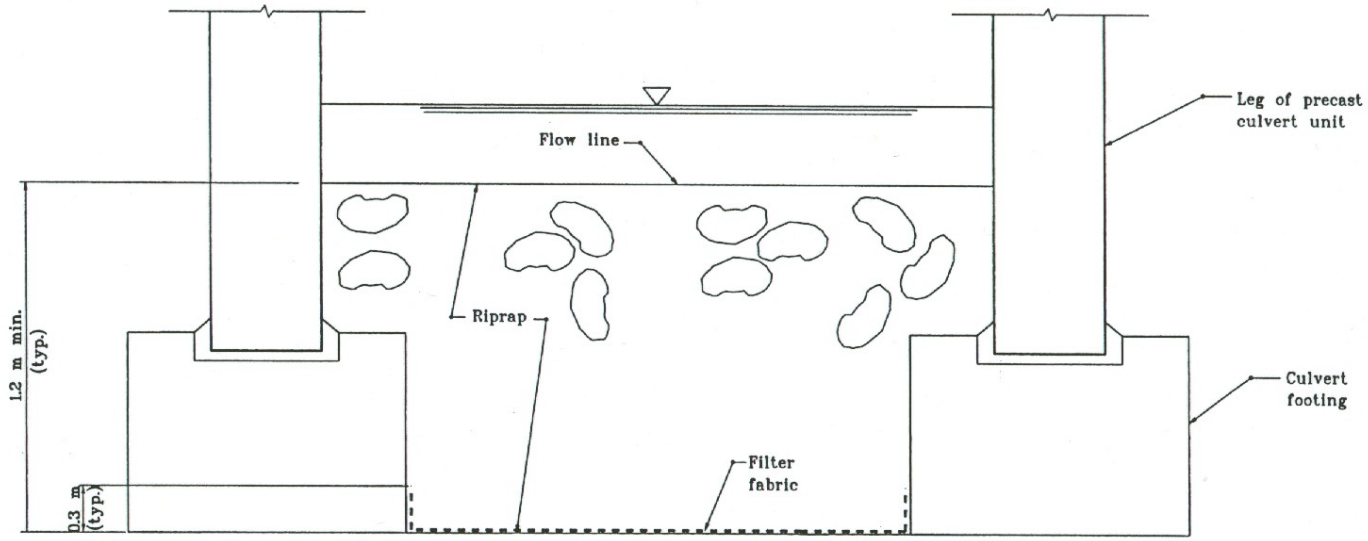
ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DESIGN STANDARDS ENGINEER DATE

CHIEF HIGHWAY ENGINEER DATE

Source Sheet: None




SECTION A–A

RIPRAP METHOD
For Span Width from
3.0 m to less than 6.0 m

All dimensions are in mm unless otherwise specified.

INDIANA DEPARTMENT OF TRANSPORTATION

THREE SIDED CONCRETE CULVERT SCOUR PROTECTION

JUL98 FOR JAN99

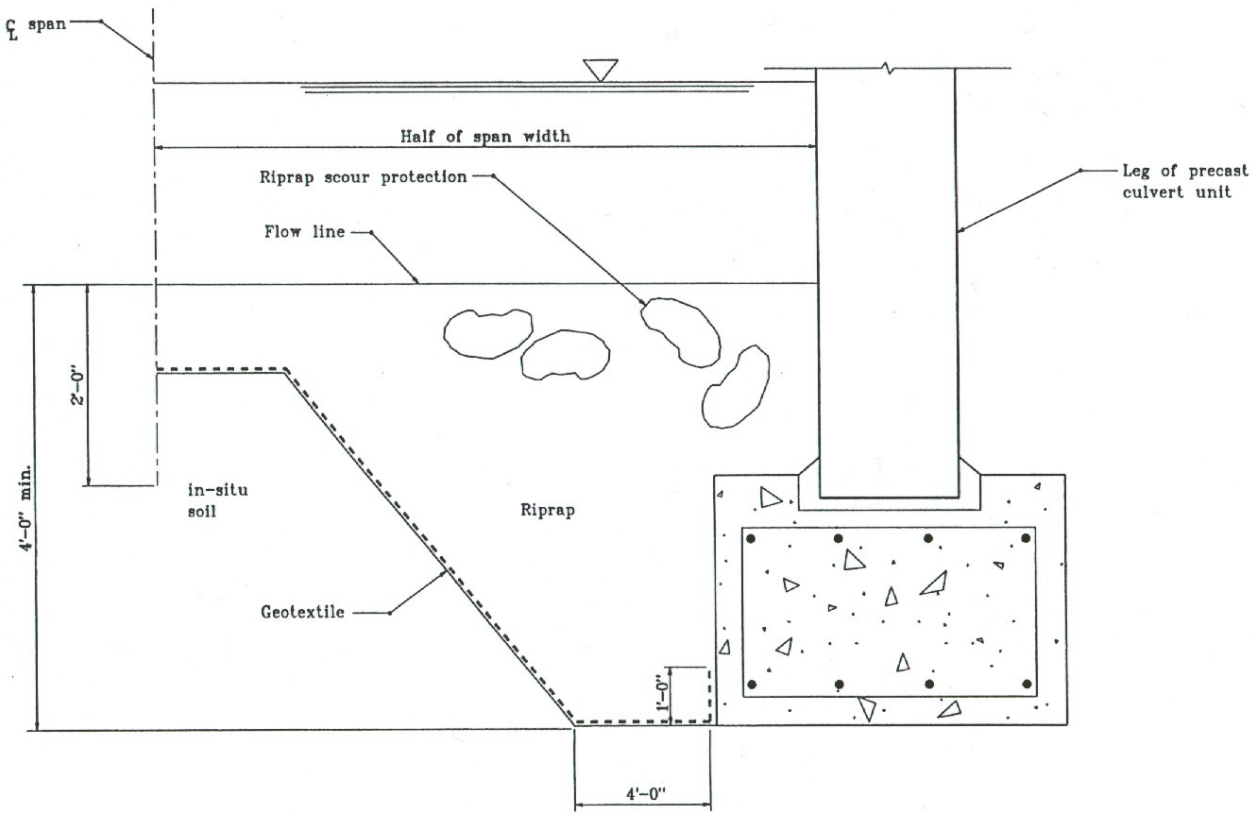
STANDARD DRAWING NO. 714–CCSP–03

ANTHONY L. URENOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER
DESIGN STANDARDS ENGINEER

DESIGN STANDARDS ENGINEER DATE

CHIEF HIGHWAY ENGINEER DATE

Source Sheet: None




SECTION A-A

RIPRAP METHOD

For Span Width of 20'-0" or Greater.

INDIANA DEPARTMENT OF TRANSPORTATION

THREE SIDED CONCRETE CULVERT SCOUR PROTECTION

JUN98 FOR JAN99

STANDARD DRAWING NO. E 714-CCSP-02

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DESIGN STANDARDS ENGINEER

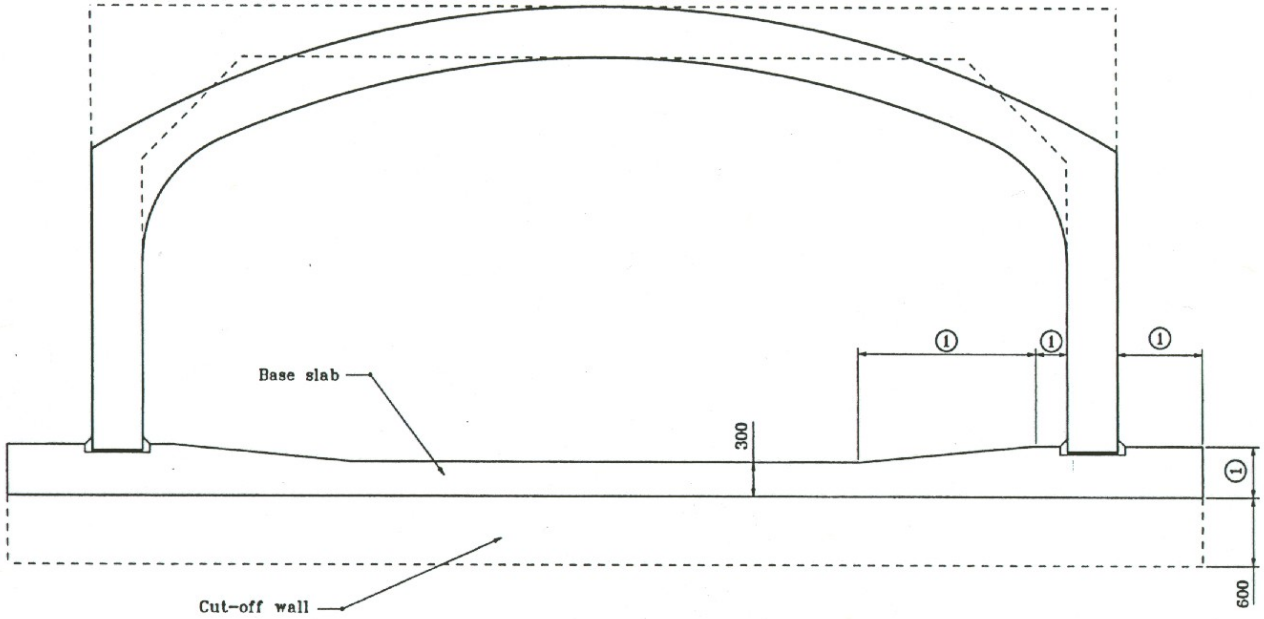
DESIGN STANDARDS ENGINEER DATE

CHIEF HIGHWAY ENGINEER DATE

Source Sheet: None

**NOTES:**

① These dimensions vary, depending on the footing design, and are shown on the plans.




SECTION B–B

BASE SLAB METHOD

For Span Width of Less Than 3.0 m

All dimensions are in mm unless otherwise specified.

INDIANA DEPARTMENT OF TRANSPORTATION

THREE SIDED CONCRETE CULVERT SCOUR PROTECTION

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STANDARD DRAWING NO. 714-CCSP-05

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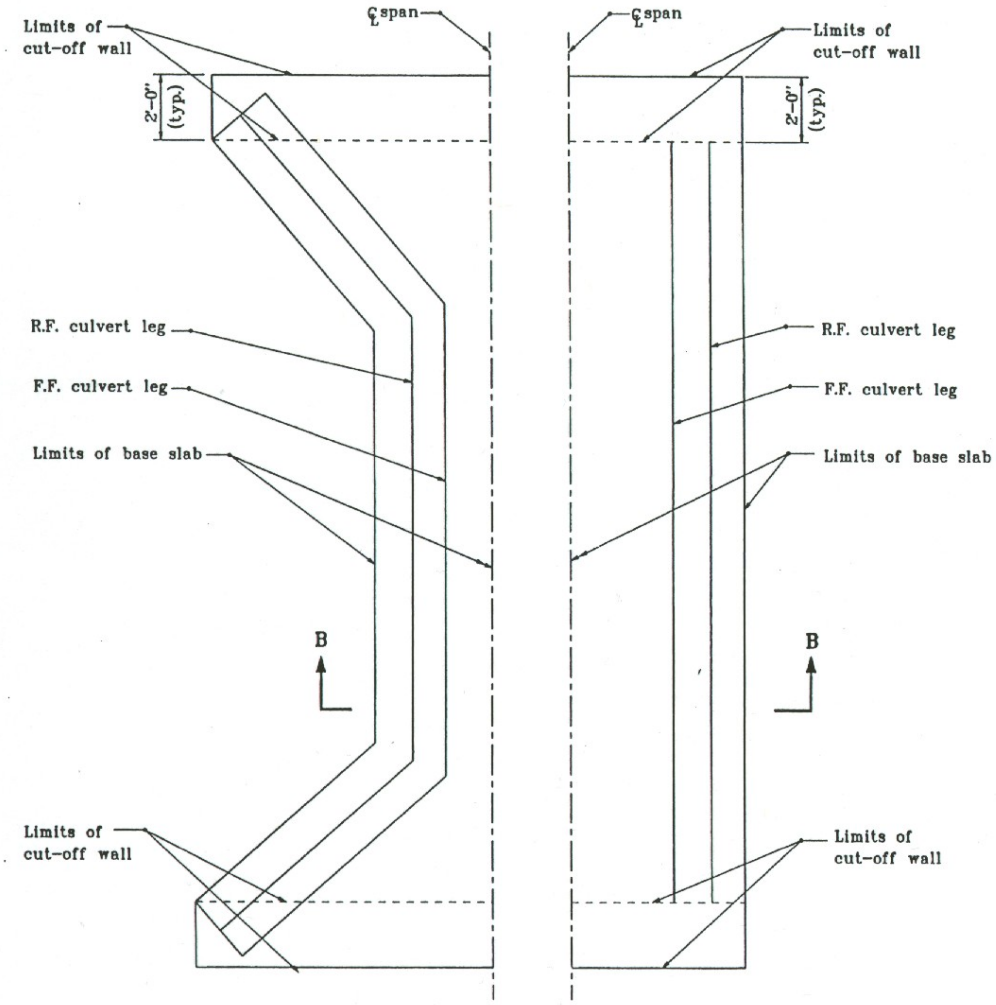
DESIGN STANDARDS ENGINEER

DESIGN STANDARDS ENGINEER DATE

CHIEF HIGHWAY ENGINEER DATE

Source Sheet: None




PLAN – WITH WINGWALLS PLAN – PROJECTING

**BASE SLAB METHOD**

**For Span Width of Less Than 10'-0"**

**NOTES:**

1. See Standard Drawing E 714-CCSP-05 for Section B-B.

F.F. = Front Face

R.F. = Rear Face

INDIANA DEPARTMENT OF TRANSPORTATION

**THREE SIDED CONCRETE CULVERT SCOUR PROTECTION**

JUN98 FOR JAN99

STANDARD DRAWING NO. E 714-CCSP-04

ANTHONY L. URENOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DESIGN STANDARDS ENGINEER DATE

CHIEF HIGHWAY ENGINEER DATE

Source Sheet: None

# QUESTIONS?

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